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Punjab, Pakistan, were selected to examine the influence of varying dietary levels of SB on the performance of growing male goats. Sixty goats of almost 10-12 months of age were divided into 5 groups of 12 animals each, in a randomized complete block design. Five iso-caloric and iso-nitrogenous total mixed rations were formulated using different levels of SB supplementation. The control diet (C) was formulated without SB, while 4SB, 8SB, 12SB and 16SB diets supplied 0.4, 0.8, 1.2 and 1.6% SB, respectively. Nutrient intake were affected ($P<0.05$) by increasing the level of dietary SB. Maximum (1.95 kg/d) and minimum (0.95 kg/d) dry matter intake were recorded in goats fed 1.6 and 0% SB diets, respectively. Similar results were noticed in CP, NDF and ADF intake. Dry matter, CP, NDF and ADF digestibility was decreased in goats with increasing level of SB in the diet. Nitrogen intake was maximum (49.29 g/d) and minimum (24.02 g/d) in goats fed C and 16SB diets. The blood pH was maximum (7.42) in goats fed 16SB diet while minimum (7.12) in those fed C diet. An increasing weight gain was observed with increasing SB level of the diet in goats. Farmers concluded that SB supplementation in goats feeding is an important nutritional tool for goat performance.

Keywords: Weight gain; Growing goat; Sodium bicarbonate

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Morphometric measurements in Lohi and Hissardale sheep for estimation of live body weight.

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Predicting the live body weight (BW) using morphometric measurements is of immense importance especially in rural areas and ceremonial events where a weighing scale is not available. Producers and buyers have to rely on visual observations for judging and pricing animals. Determination of inter-relationship of linear body measurements with BW by using statistical regression equations may be helpful in accessing the live body weight for different breeds. Lohi sheep is the most promising meat breed and Hissardale sheep is the only fine wool breed maintained in Pakistan. To determine the interrelationship, data on linear body measurements including height at withers (HAW), body length (BL), heart girth (HG), neck length (NL), neck width (NW), ear length (EL) and ear width (EW) was collected from animals categorized into three age groups (≤6, 7-12 and 13-18 months) for Lohi (n=246) and Hissardale (n=189) sheep from the Livestock Production Research Institute, Okara and Livestock Experiment Station, Khanewal, respectively. Mean BW at ≤6, 7-12 and 13-18 months age in Lohi breed was 10.87 ± 1.82, 16.40 ± 1.40 and 21.04 ± 1.44 kg and Hissardale sheep was 9.35 ± 4.82, 24.62 ± 3.33, and 26.60 ± 2.41 kg, respectively. Body weight was significantly ($P<0.001$) correlated with HAW for three age groups (0.93, 0.81, 0.69 and 0.79, 0.85, 0.67), BL (0.94, 0.81, 0.31 and 0.69, 0.83, 0.53) and HG (0.91, 0.78, 0.57 and 0.58, 0.85, 0.70) in Lohi and Hissardale breed, respectively. Other body measurement like NL, NW, EL and EW recorded significant differences (0.05) but were less correlated except at 13-18 months age in Lohi sheep. It is therefore concluded that body measurements can be used as an important tool to estimate the live body weight under field conditions as these appeared to be strongly correlated with BW.

Keywords: Lohi sheep; Hissardale sheep; Linear body measurements; Live body weight

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Pre-weaning growth performance of crossbred lambs (Dorper x indigenus sheep breeds) under semi-intensive management in eastern Ethiopia.

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This study was conducted to assess the effect of genetic and non-genetic factors on pre-weaning performance of crossbred lambs at Haramaya University, Ethiopia. Data of 275 Dorper sire breed x indigenous (Blackhead Ogaden [BHO] and Hararghe Highland [HH]) crossbred lambs with different blood levels of the parental breeds, collected for a 3 year period (2009 to 2011), were used in this study. Pre-weaning performance parameters of crossbred lambs studied were birth weight, weaning weight and pre-weaning average daily gain. Data were analyzed using the GLM procedure of SAS (2003). Breed group and non-genetic factors significantly affected pre-weaning performance. Lambs with 75% Dorper and 25% indigenous breeding had higher ($P<0.05$) birth weight than 50% but similar to 50% BHO. ¾DR¼ BHO and ¾DR¼HH lambs recorded higher weaning weights ($P<0.05$) and pre-weaning live weight gain ($P<0.01$) than lambs with 50% Dorper inheritance. Single born lambs had a higher weight at birth, weaning weight and pre-weaning average daily gain compared with twins. Sex comparison is significant ($P<0.05$) and male lambs recorded higher pre-weaning growth performance compared with their female counterparts. Parity, season and lambing year significantly ($P<0.01$) influenced pre-weaning growth of crossbred lambs. Therefore, it would be possible to conclude that 50 - 75% Dorper inheritance improved pre-weaning performance of indigenous breeds of Hararghe Highland and Blackhead Ogaden sheep. The results also suggest culling of ewes older than fourth parity to improve the pre-weaning performance of lambs.

Keywords: Crossbreeding; Fixed effects; Lamb; Pre-weaning

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Intramuscular fat and melting point variation in sheep supplemented with Spirulina.

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Spirulina (*Arthrospira platensis*) is a highly nutritious and edible microalga, but knowledge about the productive response of sheep to Spirulina supplementation is scanty and its impact on intramuscular fat deposition in lambs largely unknown. We tested the hypothesis that Spirulina lowers intramuscular fat levels and improves meat tenderness at low levels of supplementation without detrimental effects on eating quality. Therefore, the objective of this study was to investigate the influence of varying levels of Spirulina supplementation on Longissimus dorsi intramuscular fat (IMF) content and fat melting point (FMP) in crossbred sheep. Twenty four, prime lambs sired by

Dorset, White Suffolk, Black Suffolk and Merino rams were weaned at six months of age and subjected to a nine-week feeding trial at 3 levels of Spirulina supplementation including a control group (0%), and low (10% wt/vol) and high (20% wt/vol) levels. Each treatment group had a random allocation of 8 lambs balanced by gender (ewes and wethers), body condition score (average of 3.1 ± 0.4) and body weight (average of 37.6 ± 5.2 kg). Lambs in the low and high supplementation groups were drenched daily with Spirulina prior to being released for grazing with the control group. Lambs were slaughtered in a commercial abattoir and Longissimus dorsi muscle samples taken for laboratory determination of IMF and FMP. Intramuscular fat and melting point data were subjected to statistical analyses utilizing General Linear Model procedures in SAS with sire breed, sex, Spirulina level and their second-order interactions fitted as fixed effects and sire as a random variable. It was evident that the higher the level of Spirulina supplementation, the lower the fat content in which IMF significantly ($p<0.05$) dropped from 2.1 ± 0.3% in the control group, to 1.6 ± 0.2% and 1.4 ± 0.1% in the low and high supplementation groups, respectively. FMP values were similar between the control (44.0 ± 0.6°C) and high (44.2 ± 0.2°C) supplementation groups, but significantly lower ($p<0.01$) in the low (42.9 ± 0.7°C) treatment group. These results suggest that Spirulina supplementation at a 10% inclusion level has the potential to produce leaner, healthier meats containing more monounsaturated and long-chain polyunsaturated fatty acids with low fat melting points, with relatively little impact on overall eating quality when compared to meat from lambs at either 0% or 20% supplementation levels.

Keywords: Spirulina; Intramuscular fat; Melting point; Prime lamb; Sheep

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Effects of rearing systems on fat deposition and fatty acid composition of Tan lambs.

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This study was conducted to investigate the effects of different rearing systems on body fat deposition and the fatty acid composition in the body fat of Tan lambs in Yanchi County of Ningxia Province. Thirty, 3-month-old male Tan lambs were randomly divided into 5 groups (A, B, C, D, E). Lambs in group A were grazed for 12h per day on a 13-hectare grassland without supplementary feeding. Lambs in group B were grazed for 8h on a 13-hectare grassland with a 150 g-concentrate supplement per day in the former two months and 300 g-concentrate supplement per day in the later two months. The grazing time of group C was for 4h per day, and the concentrate supplement was 150 g (the former two months) and 300 g (the latter two months). Meanwhile, these three indexes in group D were 2 h, 300 g and 500 g. The four grasslands were linked together and their vegetation was similar. Lambs in group E were the control. In this group, all lambs had the same access to the concentrate as group D, and they could eat Caragana microphylla freely. In addition, 150 g (the former two months) and 300 g (the latter two months) alfalfa per day was added to the feed of group E. After 4 months, all lambs were slaughtered. Each part of the body fat (subcutaneous fat, abdominal fat, tail fat and kidney fat) was weighed and collected to analyze the fatty acid composition. The results showed that the percentage of every main fat part to the whole body fat did not differ but the absolute weight of the same part varied among the groups. Overall, subcutaneous fat can reach 37% of the body fat, and abdominal fat and kidney fat is 7% and 6% respectively, while tail fat is 50% in the whole body. Similar to fat deposition, the ratios of main fatty acids like LCFA, SFA, MUFA, PUFA, N-3 and N-6 of the whole fatty acids in the same part showed no distinctions among groups. However, pronounced differences existed in the fatty acid composition between tail fat and the other parts. The percentage of SFA of tail fat was 45%, while it showed 58, 64 and 62%, respectively in the other three parts (subcutaneous fat, abdominal fat and kidney fat). The ratios of MUFA of these four parts (tail fat, subcutaneous fat, abdominal fat and kidney fat) were 41, 37, 29 and 32%, respectively. The other parameters of tail fat are just like the other parts. In conclusion, rearing systems have little effect on the fat deposition and fatty acid composition, but locations of fat can change the fatty acid composition dramatically. Thus, the results of this study suggest an attractive implication to study the development and utilization of tail fat.

Keywords: Rearing systems; Fat deposition; Fatty acid composition; Tan lamb

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Determination of GRα mRNA expression in tissues of gilts during late gestation in hot summer.

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The study was conducted to determine the GRα mRNA expression in different tissues of gilts during late gestation in a high ambient temperature. The object of this study was to investigate the relationship between the GRα mRNA expression and physiological development of gilts during late gestation in order to provide the basic reference data for the study of molecular mechanisms of heat stress. Twelve gilts (Landrace × Large White) in late gestation were assigned into two treatments (6 gilts/ treatment) according to the gestational day (90 and 110d). The gilts were slaughtered and tissues including brain, ovary, heart, liver, spleen, lung and kidney were collected aseptically over liquid nitrogen and frozen at -80°C. Then, total RNA isolation and reverse transcription, quantitative real-time PCR (qRT-PCR) were performed to determine the mRNA expression of GRα in different tissues of gilts during late gestation. The results showed that the mRNA expression level of GRα in different tissues of gilts at d 90 of gestation was as follows: lung > spleen > liver > kidney > brain > ovary > heart; d 110: spleen > lung > liver > kidney > ovary > heart > brain. Comparing d 110 with d 90 of gestation, except that the expression of GRα in lung and brain was significantly reduced ($P<0.01$), and was reduced ($P<0.05$) in liver, there were no gestation stage dependent effects on GRα mRNA expression in all the other tissues ($P>0.05$). Our results indicate that the mRNA expression of GRα was higher in lung and spleen of gilts during late gestation, to a lesser degree in liver and kidney, and lower expression levels of GRα were observed in brain, ovary and heart. Comparing d 110 with d 90 of gestation, the